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WORK OF THE LAKE STATES FOREST EXPERIMENT STATION IN NORTH DAKOTA

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The Lake States Forest Experiment Station began studies in North Dakota in 1931. Several leading citizens of the state wanted forest research and were sufficiently interested to get Congressional appropriations to begin it. In October 1929, North Dakota's Senator Gerald P. Nye wrote Chief Forester Stuart for suggestions as to how forestry work could be started in the Mouse River Loup area. This led to a field examination by Director Zon and State Forester F. E. Cobb. A report on this examination led Senator Nye to work for an appropriation, finally made by Congress in 1931, for the establishment of a branch station of the Lake States Forest Experiment Station in the North Dakota sandhills, under authorization of the McSweeney-McNary law. Work was set up in cooperation with the North Dakota State School of Forestry at Bottineau. The work originally envisaged included:

1. Planting experiments in the sandhills near Towner, North Dakota to get under way immediately.

2. Erosion control planting on the bad lands of the Missouri River in western North Dakota.

3. A study of windbreaks throughout North Dakota.

Several areas were examined and Section 36, T. 156 N., R. 78W., near Denbigh, was selected as most suitable for the sandhill planting studies.

In April 1931, this section of state land was withdrawn from leasing by the State Land Commissioner and made available to the North Dakota State School of Forestry for experiments in cooperation with the Federal Government. So that Forest Service buildings could be constructed, the McHenry County Commissioners bought the NW¼ of the NW¼ of the section from the State, and then deeded it to the Federal Government. The deed was recorded on August 11, 1931.

Among the North Dakotans prominent in getting this project started, aside from Senator Nye, were Congressmen Hall and Sinclair, State Forester Cobb, and A. M. Christianson, Associate Justice of the North Dakota Supreme Court.

What Has Been Accomplished

Substantial progress has been made in all three lines of work originally contemplated. Although the Station has directed more attention toward sandhill planting, it also undertook experiments in erosion control planting in the Missouri River badlands, and it made a state-wide study of windbreaks which was reported in USDA Circ. No. 344, "Causes of Decadence in the Old Groves of North Dakota," 1935.

Maintained by the U. S. Department of Agriculture, Forest Service, in cooperation with the University of Minnesota.

A field station was established in 1931 in the sandhills near Denbigh. Five acres were planted in 1931, about 40 acres in 1932, and similar large areas for several years thereafter. By 1940, when active planting ceased, 270 acres of experimental plantations had been established (see attached map). More than 40 tree species have been tested; over half of them conifers. Native species have been used most, but some from Europe and Asia have also been tried. On the drier dunes, the only species to make a go of it are ponderosa pine, Rocky Mountain juniper, eastern red-cedar, jack pine, and Scotch pine. On the slightly moister and more fertile sand plains, these same species are the best of the conifers, but Siberian larch and tamarack show some promise; and western white spruce and blue spruce do fairly well between nurse-rows of faster growing hardwoods. Cottonwood, green ash, and boxelder are the best of the hardwoods. Bur oak survives fairly well, but grows very slowly. Siberian elm (commonly called Chinese elm) has good survival but freezes back frequently. Its only value is as a nurse crop. For all these species it is important to get the right source of seed. In the poorly drained swales no species tried have done very well. Cottonwood and willow appear best.

The first plantings were made in furrows, as had been done in the Nebraska sandhills. It soon became apparent that not enough relief from sod competition was provided by furrows. Hand weeding and cultivation were tried. Then plowed strips were used. Cultivation with a small tractor and shovel cultivator was tested. Finally it became evident that the sand-plains planting would have to be done by methods recommended for shelterbelts: (1) the ground must be well prepared before planting; (2) for at least five years after planting, three or four annual cultivations are needed to keep down competing grass and weeds. In the dunes, mechanical ground preparation and cultivation is impractical. Better establishment is promoted by shading planted trees with brush. Of course, protection is necessary from fire, rabbits, insects, and other enemies.

In addition to the field plantations, an arboretum was established in 1940 to 1942 on an area which had formerly been a small nursery, just north of headquarters. Some 29 species are presently growing here (see table 1 and diagram). Most surprising has been the growth and survival of tamarack.

Aside from the main planting studies, nursery experiments were conducted at Denbigh, Bottineau, Towner, and Oakes; sandblow plantings were made in several localities; shelterbelt effects on snow drifting and soil moisture were studied; and grassland succession and water levels were recorded.

The original plan for the Denbigh work was to carry out initial experiments on Section 36, and then to carry out findings on a pilot-plant scale on an experimental forest made up of six or eight surrounding sections. These results, in turn, would be applied on national forests to be established on the sand plains. The latter aspect materialized to this extent: (1) the State Legislature passed enabling legislation in 1933; (2) the National Forest Reservation Commission in 1935 approved the purchase of a 200,000-acre unit in McHenry, Bottineau, and Pierce counties, and a 60,000-acre unit in Ransom and Richland counties; (3) the U. S. Forest Service established a forest nursery at Towner. Because of difficulties in land purchase, however, these units never became actively established.

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DIAGRAM OF DENBIGH ARBORETUM

1 Black spruce 1942	2 Cotton-wood 1940	3 American elm 1940	4 Ponderosa pine 1/ 1940	5 Northern wh.-cedar 1942	6 Balsam fir 1942	7 Jack pine 1942	8 Siberian larch 1940	9 Ponderosa Scotch & Chinese R.P. 1940	10 Red pine 1942	10A Not Planted
11 Tamarack 1942	12 Hackberry 1940	13 Ponderosa pine 2/ 1940	14 Ponderosa pine 3/ 1940	15 Ponderosa pine 4/ 1940	16 Red pine 1941	17 Not Planted	18 Pyramidal juniper 1940	19 Rocky Mt. juniper 1940	20 Norway* spruce 1941	20A Scotch pine 5/ 1942
21 Not Planted	22 Blue spruce 1941	23 Western wh. spruce 1941	24 Golden willow 1940	25 Russian mulberry 1940	26 Rocky Mt. juniper 1941	27 Not Planted	28 Amur maple 1942	29 Box-elder 1940	30 Manchur-ian ash 1942	30A Chinese juniper 1942
31 Austrian & Scotch Pine 1941	32 White spruce 1941 - 42	33 Prostrate juniper 1940 - 42	34 Russian olive 1940	35 Amur* tamarix 1940	36 Limber pine 1941	37 Not Planted	38 Black* haw. 1940	39 Eastern red cedar 1942	40 Not Planted	40A Not Planted

1/ Western Nebraska source.
2/ Medora, N. D. source.
3/ Black Hills, S. D. source.
4/ Glendive, Mont. source.
5/ Finland source.

* Failure

Table 1. - Status of Denbigh Arboretum, July 10, 1951

Plot	Species	Planted	Three largest trees						Remarks
			Total height			Diameter b. h.			
		Year	Feet			Inches			
1	Black spruce	1942	3	3	2	0	0	0	Color poor, not thrifty.
2	Cottonwood	1940	42	31	48	5.0	3.8	7.0	Poor survival, spotty growth.
3.	American elm	1940	14	17	17	1.7	2.1	1.7	Spotty.
4	Ponderosa pine	1940	17	18	18	2.4	2.0	2.5	W. Nebr. source: some winter browning
5	No. white cedar	1942	7	7	7	.5	.5	.6	Looks pretty good.
6	Balsam fir	1942	6	7	8	.5	.7	.7	Spotty; good growth in 1951.
7	Jack pine	1942	19	16	17	1.9	2.0	2.0	Much snow breakage.
8	Siberian larch	1940	18	18	17	2.7	2.9	2.5	Variable, but looks pretty good.
9	Ponderosa, Scotch & Chinese red pine	1940	--	--	--	--	--	--	Poor; Scotch pine damaged by porcupine
10	Red pine	1942	10	10	11	1.3	1.5	1.3	Poor in low spot; fair otherwise.
11	Tamarack	1942	22	20	21	2.8	2.5	2.4	Looks quite good.
12	Hackberry	1940	9	9	10	1.0	1.1	1.2	Considerable top killing; poor form.
13	Ponderosa pine	1940	18	18	20	4.1	3.5	4.0	Medora, N.D.; only small amount winter browning.
14	Ponderosa pine	1940	17	17	19	2.9	3.1	3.8	Black Hills, S. D.; more winter browning than other source.
15	Ponderosa pine	1940	19	18	20	3.4	3.3	3.3	Glendive, Montana; generally looks good. 1 tree girdled by porcupine.
18	Pyramidal juniper	1940	7	7	6	.4	.4	.4	
19	Rocky Mt. juniper	1940	6	7	8	.4	.5	.7	Variable; some winter damage.
20a	Scotch pine	1942	15	16	16	2.4	2.3	2.8	Finland; good form
22	Blue spruce	1941	9	10	9	1.1	1.1	1.1	Variable.
23	Western white spruce	1941	16	15	15	1.8	1.6	1.7	Quite uniform; looks good.
24	Golden willow	1940	22	24	29	3.0	3.1	4.0	Variable.
25	Russian mulberry	1940	--	--	--	--	--	--	Badly killed back.
26	Rocky Mt. juniper	1941	7	6	7	.5	.6	.6	Some winter browning
28	Amur maple	1942	3	3	4	0	0	0	Poor growth; apparently killed back.

Table 1 (Cont.) -- Status of Denbigh Arboretum, July 10, 1951

Plot	Species	Planted	Three largest trees: Total height			Three largest trees: Diameter b. h.			Remarks
		Year	Feet			Inches			
29	Boxelder	1940	18	19	20	2.7	2.6	2.7	Quite vigorous.
30	Manchurian ash	1942	2	3	3	0	0	0	Frozen back.
30a	Chinese juniper	1942	4	4	3	0	0	0	Many tops killed back
31	Austrian pine & Scotch pine	1941	-	-	-	-	-	-	Most Austrian pine dead; Scotch pine badly damaged by porcupine.
32	White spruce	1941-42	18	13	14	2.6	1.5	1.7	Yellowish color, but otherwise quite good.
33	Prostrate juniper	1940-42	3	3	4	0	0	0	Fairly uniform.
34	Russian olive	1940	10	9	11	.8	1.3	1.1	Continuing mortality.
36	Limber pine	1941	5	5	4	.5	.5	0	Spotty; some winter damage to shorter trees.
39	Eastern redcedar	1942	6	5	5	.3	.2	.2	Spotty; some winter damage.

By 1937, the findings of the Station indicated that it was neither advisable nor feasible to go ahead with the original plan of planting large solid blocks of sandhill land to trees. The relatively high value of the land for grazing, and the high cost of successful planting dictated this conclusion. The most logical plan, according to present knowledge, would be to plant trees on the open dunes and in strips on not over 10 percent of the sand plains, giving them adequate protection from livestock and wildlife. The great recreational value of tree growth in the plains, even more than the high value of wood products, is a major justification for this plan.

Future Possibilities

The North Dakota forest research project began with adequate funds-a special appropriation of $15,000. After the first year, however, there was no special appropriation, but the funds for this project were included within the forest-management allotment to the Station. Serious cuts in regular funds began in 1933, with a 23-percent reduction, and there were few years thereafter when the entire allotment for seed, nursery, and planting investigations for the entire Station exceeded $15,000.

To some extent the reductions in regular funds were offset by the availability of emergency funds and labor. During 1933, crews of 10 to 60 CCC boys made it possible to carry on most of the plan. In 1934, an FERA program was set up for the Denbigh Station, and the bulk of the work through 1939 was carried on with ERA or WPA labor. The amount of emergency help diminished steadily, however,

Beginning in 1931, the State Legislature had made biennial appropriations of $2,500 to aid the project. This money had been used for growing some of the stock needed, to pay North Dakota State School of Forestry students who lived and worked at the Station part of the year, and to pay a caretaker for the winter months. However, in 1939 the State Forester attempted to get this money allotted for a forest survey of the state. The legislature responded by eliminating the appropriation.

It became necessary to place the Denbigh Station on a maintenance basis after July 1939, although a field assistant was kept there throughout the field season until 1941. With further cuts in regular funds, and elimination of emergency funds, greater retrenchments were necessary beginning in 1942. Since then a technical man has spent a week or two a year in checking results, the plantations have been cultivated regularly two or three times a year, and the buildings and fences have been maintained, so as not to lose the investment already made. During recent years the total funds available for this project, exclusive of technical supervision, have been from $400 to $800 per year.

The forest research already done in North Dakota has yielded promising results. It should not be dropped. Yet under present appropriations the Lake States Station cannot even maintain its equity in past work. What of the future? There are a number of alternatives, and which one to follow depends largely upon the interest North Dakotans show in the continuation of experimental work. First is the possibility of establishing a forest research center in North Dakota. Since 1946 such centers have been established in Michigan, Wisconsin, Minnesota, and in most other eastern, southern, and far western states. Such centers are under the administrative jurisdiction of the regional forest experiment stations; yet because of their local character they are particularly responsive to research needs of a state. Recently, through Congressional action, a work center of this type was established in New Mexico.

The second alternative is to work for the establishment of a Plains States Forest Experiment Station. Such a station was authorized by Congress several years ago but funds for establishing it have never been appropriated. Such a station would give strong emphasis to your North Dakota forest problems but would, of course, call for much larger appropriations than for a research center.

A third alternative would be for the state to take over maintenance of plantations and buildings with the Lake States Station providing some guidance and continuance of records. In this case the state could use the area for training and demonstration purposes. This would be a holding approach and unless the state made adequate provision for financing, no new work could be initiated.